Section 3.4 - Predictions & Lines: y = mx + b

Curriculum Outcomes	Related Activities	Page in Text
• determine the slope and y-intercept of a line from a table of values	• an investigation explores the connection between the values of m and b in an equation, the graph of the equation, and the original situation	118
• determine the equation of a line using the slope and y-intercept	• a Focus shows the connection between the graph, equation, and the m and b and demonstrates how slope can be found and why it is important	117
• rearrange equations	• students solve problems using the skills they have learned with writing equations in the form y = mx + b • students investigate how to find equations of straight lines from limited information and use the equations to solve problems	122 126
• graph by constructing a table of values, by using graphing technology, and when appropriate by intercept-slope method	• students rearrange equations and formulas in order to graph the equation of enter formulas into a spreadsheet.	128

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- The equations we have been dealing with are linear equations or equations of lines.

- Equations of lines can be written in y = mx + b format or slope y-intercept form which is also known as standard form.

- To be able to determine the equation of a line we need 2 things: 1. a slope
  2. a point on the line

Oct 29-7:47 PM

SLOPE:

- the steepness of a line
- in equation form it is the coefficient of the variable x.
- in the format y = mx + b m = slope

Oct 29-8:12 PM

Types of Slopes:

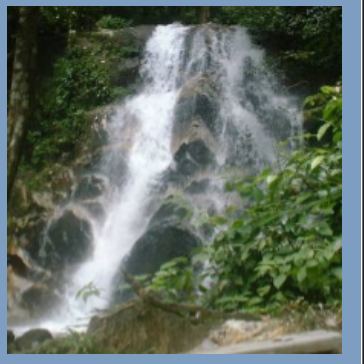
Slope

Positive

Negative

Undefined

Zero



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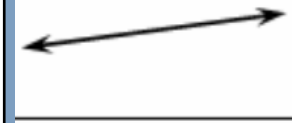
Steepness of Slopes:

Examples of Slopes for Steepness			
			
Not Steep	A Little Steeper	Even Steeper	Very Steep
Slope = 0.1	Slope = 1	Slope = 2	Slope = 4

Small slope **Large slope**

Oct 29-8:26 PM

How to Find Slope:

1. From the equation $y = mx + b$

the number found where the "m" is

Examples:

1. $y = -2x + 3$

$m = -2$

2. $y = \frac{1}{3}x - 2$

$m = \frac{1}{3}$

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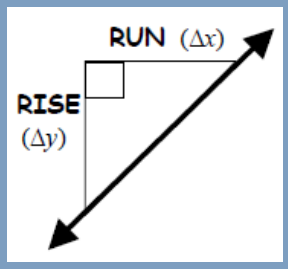
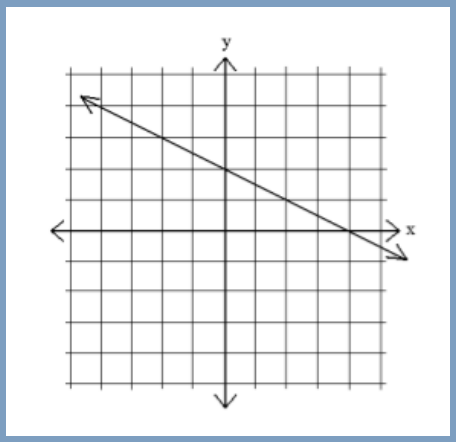
2 From a graph using $\frac{\text{rise}}{\text{run}}$



Examples:

1.



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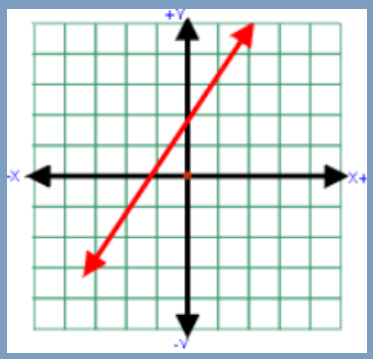

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3 From 2 co-ordinate points

$m = \frac{y_2 - y_1}{x_2 - x_1}$ → y being the 2nd number in a co-ordinate (x,y)

→ x being the 1st number in a co-ordinate (x,y)

Examples:

1. (2, 7) & (5,1)
   $x_1\ y_1$ $x_2\ y_2$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-7}{5-2} = \frac{-6}{3} = -2$

2. (-2,5) & (-5, 5)

$\frac{5-5}{-5+2} = \frac{0}{-3}$

zero

undefined

$\frac{3}{0} =$

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Pg. 129 #2, 3) show work for #2

2.a. $(1,1)$ $(4,3)$ Take out

$\frac{3-1}{4-1} = \frac{2}{3}$ $m = \frac{2}{3}$

$m = \frac{y_2 - y_1}{x_2 - x_1}$

(2) e. $(5,3)$ $(7,3)$

slope $\frac{3-3}{5-7} = \frac{0}{-2}$ $m = 0$

(h) $(2,-3)$ $(0,4)$

$\frac{4--3}{0-2} = \frac{7}{-2}$ $m = -3.5$

(3) g. $(0.5,3)$ $(2,-3)$

$\frac{-3-3}{2-0.5} = \frac{-6}{1.5} = -4$ $m = -4$

Nov 12-2:58 PM

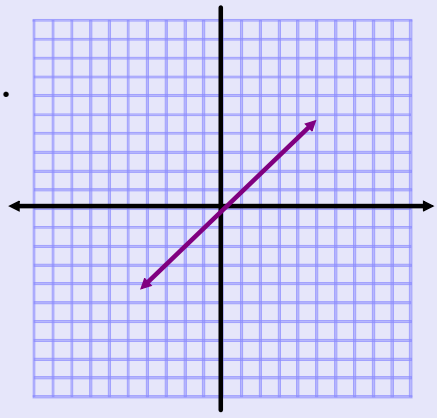
Practice:

State what the slope is for each of the following questions:

1. y = -2/3x +2

$m = -2/3$

2.



3. (1,4) (-8, -7)

$\frac{-7-4}{-8-1} =$

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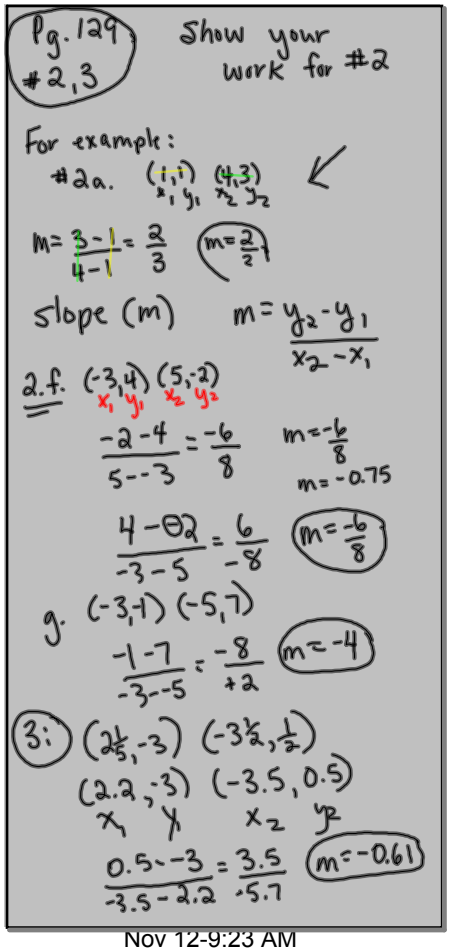

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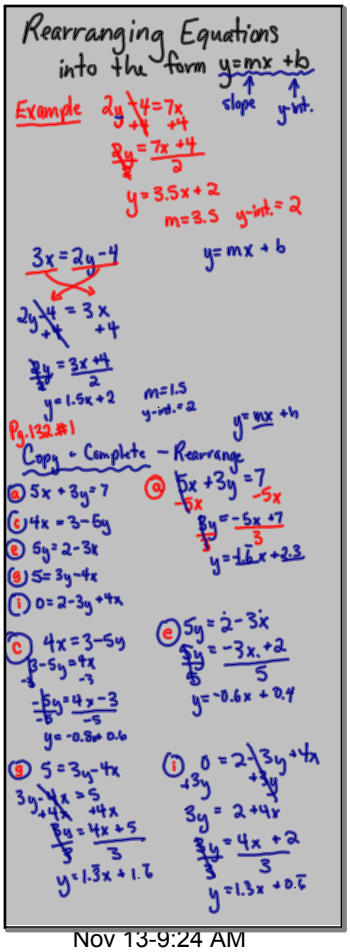

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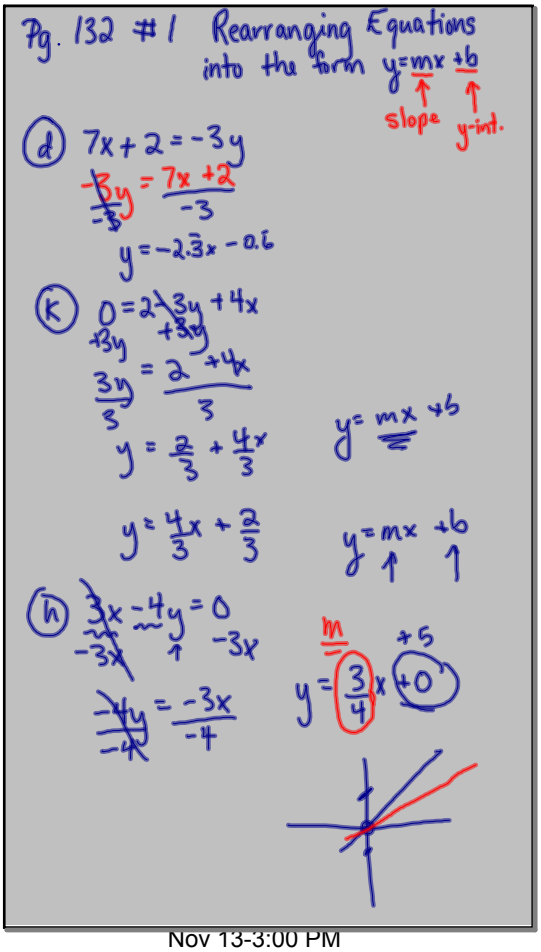

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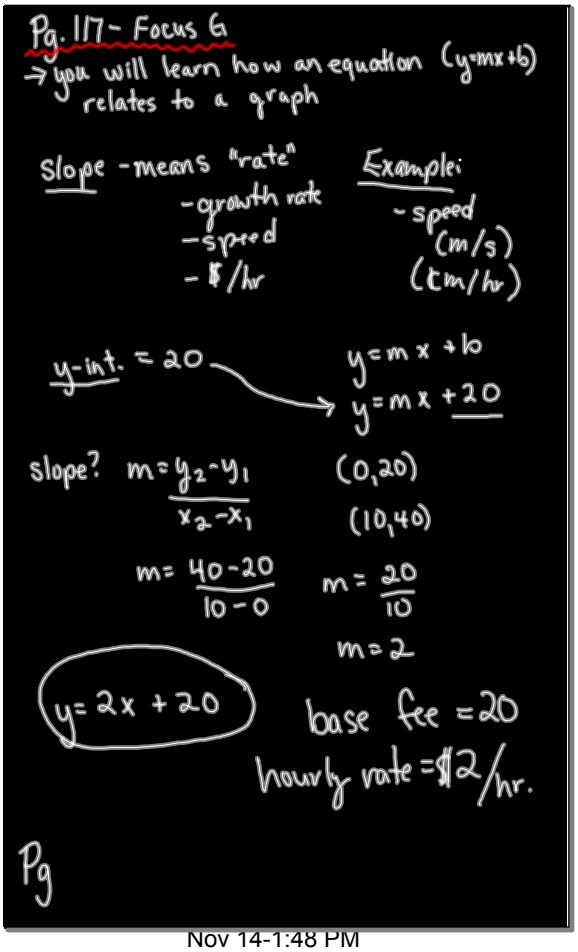


Nov 14-1:48 PM

Pg. 118 Investigation 5

A, B, C #1-4

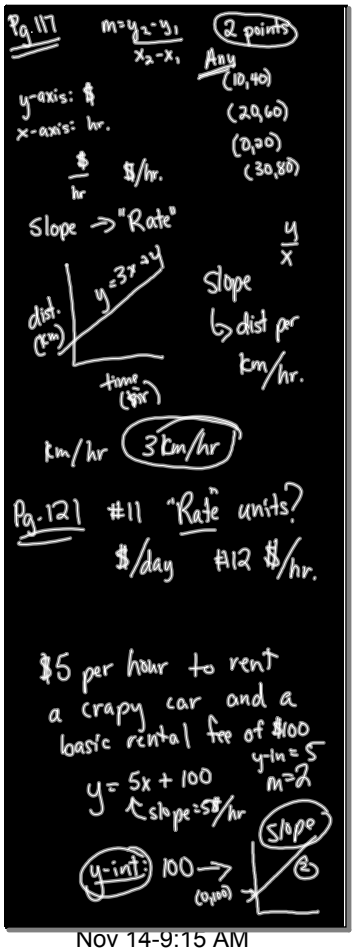
$y = mx + b$ (,) (,)

$m =$

y-int =

$y = \_\_ x + \_\_$

Nov 14-1:48 PM



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Pg. 117

- y-int. is 20
- slope (m) $m = \frac{y_2 - y_1}{x_2 - x_1}$ (10,40) (20,60)

$= \frac{60-40}{20-10} = \frac{20}{10} = 2$

$m = 2$

- Eqn. of the line: $y = mx + b$

$y = 2x + 20$

$2/hr$ 20 fee

5 hours of use:

$y = 2(5) + 20$

$y = 10 + 20$

$y = 30$

It costs $30 for 5 hrs. of use.

$y = mx + b$ $m = \frac{y_2 - y_1}{x_2 - x_1}$

"rate" means slope

"basic fee" means y-int.

Nov 14-9:31 AM

Investigation 5 Pg. 118-119

Answer A, B, C

#1-4

(A) $y = mx + b$ m = slope, b = y-int.

Company 1 (12,45) (0,10)

$m = \frac{y_2 - y_1}{x_2 - x_1}$ $m = \frac{45-10}{12-0} = \frac{35}{12}$ $m = 2.9$

$y = 2.9x + 10$

(B) Company 2 (0,20) (10,35)

$m = \frac{35-20}{10-0} = \frac{15}{10}$ $m = 1.5$

$y = 1.5x + 20$

(C) Company 3 (2,20) (8,35)

$m = \frac{35-20}{8-2} = \frac{15}{6}$ $m = 2.5$

$y = 2.5x + 15$

Domain $\{x \mid x \geq 0, x \in R\}$

Range $\{y \mid y \geq 15, y \in R\}$

Nov 16-10:23 PM

#1

$50 = 2.9x + 10$

$-10 \quad -10$

$\frac{40}{2.9} = \frac{2.9x}{2.9}$ $x = 13.8$

C#1 → 13.8 hrs

$50 = 1.5x + 20$

$-20 \quad -20$

$\frac{30}{1.5} = \frac{1.5x}{1.5}$ $x = 20$

C#2 → 20 hrs

$50 = 2.5x + 15$

$-15 \quad -15$

$\frac{35}{2.5} = \frac{2.5x}{2.5}$ $x = 14$ hrs

I would use Company 2 because you can get the greatest number of hours.

20 hrs.

Nov 17-8:59 AM

Pg. 119 #5

(a) speed: Km/hr. slope = $\frac{y_2 - y_1}{x_2 - x_1}$ $\frac{Km}{h}$

slope = $m = \frac{y_2 - y_1}{x_2 - x_1}$ (0,100) (10,1100)

$m = \frac{1100 - 100}{10 - 0} = \frac{1000}{10}$

$m = 100$

100 km/hr.

The car is going 100 km/hr. for the entire trip.

(b) how far? - Km y-int.

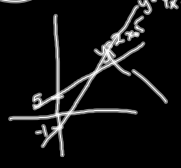
100 km from home.

#6 $y = mx + b$

#7

#8 (a) $y = 2x + 5$ $2/hr.

$y = 4x - 1$



$5

$y = 2x + 5$

$y = 4x - 1$

Pg. 120 - 121

6 - 12

Nov 17-9:08 AM

Classwork/Homework

Pg. 119-121 # 5-12

Nov 16-10:24 PM

Nov 17-9:08 AM

ANSWERS
Classwork/Homework

Pg. 119-121 # 5-12

#5 a) To find the speed, you need to find slope

slope = $m = \frac{y_2 - y_1}{x_2 - x_1}$ → You need any two points from the graph

(0,100) and (10,1100)

$m = \frac{1100 - 100}{10 - 0} = \frac{1000}{10} = 100$

The speed of the car was 100 Km/hr. during the entire trip.

b) The journey began 100 km from home. We know this because the line begins at 100 on the y-axis. The y-intercept is 100.

c) $y = mx + b$ Fill in the values from "m" and "b"

$y = 100x + 100$

#6 a) Her weekly earnings does not depend on her sales, it only depends on the number of hours she works.

b) $y = mx + b$ we need to find m (the slope) and "b" (the y-intercept)

$m = \frac{y_2 - y_1}{x_2 - x_1}$ → We need 2 points from the graph: (0,0) and (5,40)

$m = \frac{40 - 0}{5 - 0} = \frac{40}{5} = 8$ $m = 8$

"b" is the y-intercept (where the line crosses the y-axis)

$b = 0$

Equation is $y = 8x + 0$ or $y = 8x$

#7 a) To find out how much it costs to print each copy, we need to find the slope.

slope = $m = \frac{y_2 - y_1}{x_2 - x_1}$ → We need 2 points (0,600) (400,800)

$m = \frac{800 - 600}{400 - 0} = \frac{200}{400} = \frac{2}{4} = \frac{1}{2} = 0.5$

It costs $0.50 per copy or 50¢ per copy.

Nov 17-9:08 AM

#7b. To find the cost to set up the printing equipment we need to find out (from the graph) how much we have to pay at first before making any copies. This is when x would equal zero.

When is "x" zero? At $600.

This is also the y-intercept.

c. $y = mx + b$ Fill in the values from "m" and "b".

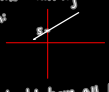
$y = 0.50x + 600$

("y" is the cost and "x" is the number of copies)

#8 a) $y = 2x + 5$

- The hourly wage is $2.00 per hour
- The monthly fee is $5.00.

Sketch:



a-f should have all been done this way.

- "c" and "f" should have negative slopes
- "b" should have a negative y-intercept.

You should have noticed that b, c, and f don't make sense as "internet providers" → the internet company is not going to pay you to use their internet.

#9 *can only use #8 equations a, d, and e.

a) To find out which is better, we need to fill 13 in for "x" in each equation.

$y = 2x + 5$	$y = 0.5x + 10$	$y = 15 + x$
$y = 2(13) + 5$	$y = 0.5(13) + 10$	$y = 15 + 13$
$y = 26 + 5$	$y = 6.5 + 10$	$y = \$28.00$
$y = \$31.00$	$y = \$16.50$	

I would use the internet provider "$y = 0.5x + 10$" because it only costs $16.50

b) To find out which will give you the most number of hours for $75.00 we need to fill 75 in for "y" in the equations.

$y = 2x + 5$	$y = 0.5x + 10$	$y = 15 + x$
$75 = 2x + 5$	$75 = 0.5x + 10$	$75 = 15 + x$
$70 = 2x$	$65 = 0.5x$	$x = 60$
$x = 35$	$x = 130$	60 hours
35 hours	130 hours!	

Nov 17-9:08 AM

#10 a) $y=mx+b$ fill the numbers in
$y=3x+12.5$
→ $12.50 for monthly fee
→ $3.00 per hour of use
Do the same for a, b, and c

#11 There are 2 ways to find the answer.
① Interpolating from the graph:
$115 → # of days
3 days
② Fill in 115 in for y
$y=mx+b$
↑ slope
$m=\frac{y_2-y_1}{x_2-x_1}$ Need 2 points (0,40) (2,90)
$\frac{90-40}{2-0}=\frac{50}{2}$ $m=25$
$y=25x+40$
$115=25x+40$
$-40 \quad -40$
$75=25x$ $x=3$
3 days

#12 To find the hourly cost we need to find the slope
slope: $m=\frac{y_2-y_1}{x_2-x_1}$ (1,310) (6,610)
$\frac{610-310}{6-1}=\frac{300}{5}$
$m=60$
The hourly way is $60.
b) 1872.50 $y=mx+b$
Fill in for y $y=60x+250$
$1872.50=60x+250$ $x=27.42$
$1622.50=60x$ 27.50 hours.

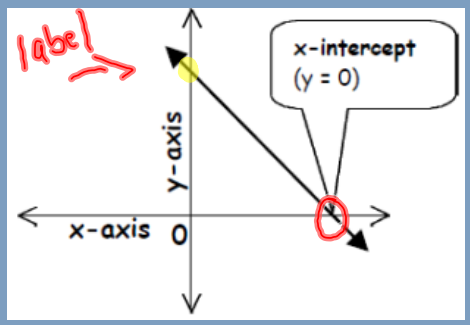
Nov 18-2:20 PM

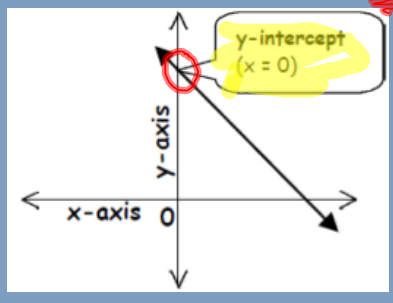
X and Y Intercepts:

X-intercept= the point where a graph (line) crosses the x-axis; the point where $y = 0$*

y-intercept= the point where a graph (line) crosses the y-axis; the point where $x = 0$*

+ b





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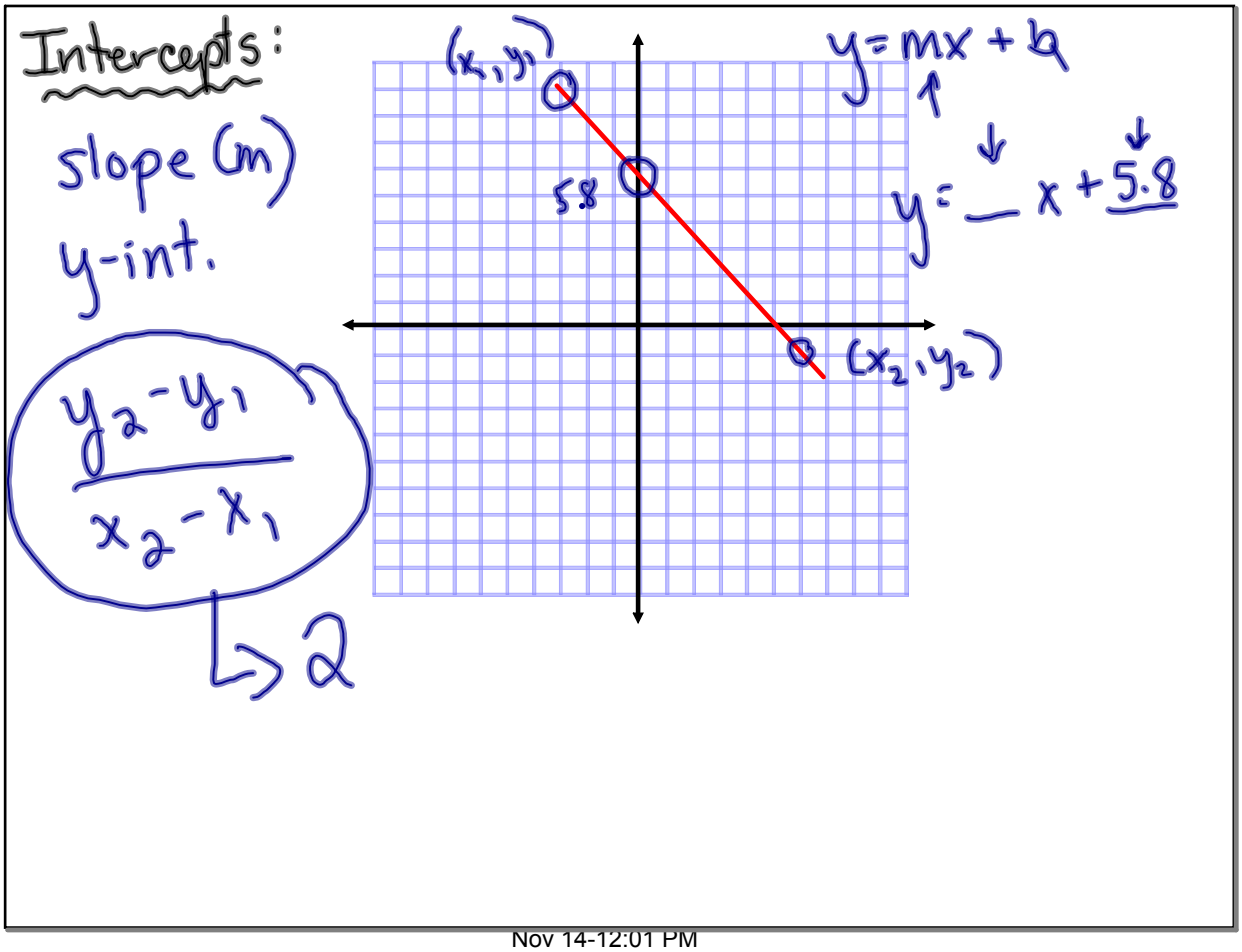


Nov 14-12:01 PM

How to Find The X & Y Intercept:

Determine the x-intercept for 2x + y = 8.

Solution:

Let y = 0 → 2x + (0) = 8

Solve for x → 2x = 8

x = 4

x-intercept is → 4 or (4, 0)

Determine the y-intercept for 2x + y = 8.

Solution:

Let x = 0 → 2(0) + y = 8

Solve for y → y = 8

y-intercept is → 8 or (0, 8)

Nov 9-11:55 AM

Practice:

Find the x and y intercept for the following equations & write them in y=mx + b form and find the intercepts (x and Y):

1. $3x + y = 9$

2. $5x + y = 20$

3. $\frac{3}{4}x + y = 8$

Find the x and y intercepts:

① $4x - 5y = -20$

x-int. ($y=0$)

$4x - 5(0) = -20$

$\frac{4x}{4} = \frac{-20}{4}$

$x = -5$

x-int $= -5$

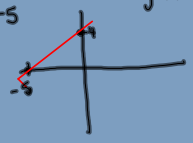
y-int. ($x=0$)

$4(0) - 5y = -20$

$\frac{-5y}{-5} = \frac{-20}{-5}$

$y = 4$

y-int $= 4$



How would you graph $y = 2x + 5$?

x	$y = 2x+5$	y
1	$2(1)+5$	7
2	$2(2)+5$	9
3	$2(3)+5$	11

(1,7) (2,9) (3,11)

$-2x + y = 5$

$+2x \quad +2x$

$\rightarrow y = 2x + 5$

Nov 9-12:11 PM

Classwork/Homework

Copy & Complete

1. **Rearrange the equations into the form y=mx + b:**
   a. $2x + 3y = 6$ b. $4x + 3y = 12$
   c. $3x + y = 9$ d. $x + 4y = 8$
   (these questions came from the yellow text Pg.111#1)

2. **Find the x and y-intercepts**
   a. $4x + 5y = 20$ b. $3x - 4y = 12$
   c. $2x + y = 4$ d. $5x + 3y = 15$
   (these questions came from the yellow text Pg.111#2)

3. **Create a table of values (at least 3 points) and graph:**
   a. $2x + y = 7$ b. $3x + y = 4$
   c. $4x + y + 4 = 0$ d. $2x - y = 5$
   (these questions came from the yellow text Pg.110 #7)

Nov 17-9:48 PM

Attachments

Sec 3.4 - Slopes.doc

Sec 3.4 - Write the equation of a line (1).doc